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EXAMINER	
KURR, JASON RICHARD	

ART UNIT	PAPER NUMBER
2615	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/806,193	JOT ET AL.
Examiner	**Art Unit**
Jason R. Kurr	2615

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 20-40* is/are pending in the application.

4a) Of the above claim(s) *6 and 8* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7 and 20-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 21, 2006 has been entered.

Claims 6 and 8 have been cancelled and thus will not be further examined.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-7 and 20-31 are rejected under 35 U.S.C. 102(e) as being anticipated by McGrath (US 6,259,795 B1) in view of Chen (US 6,990,205 B1).

With respect to claim 1, McGrath discloses a method for positioning of a plurality of audio signals, the method including: selecting a set of spatial functions, each having an associated scaling factor; providing a first set of amplifiers and a second set of

amplifiers, the gains of the amplifiers being functions of the scaling factors (col.5 ln.7-13); receiving a first audio signal of the plurality of audio signals (fig.2 #9); providing a first direction representing the direction of the source of the first audio signal (fig.2 #11 , col.4 ln.40-50); adjusting the gains of the first and the second set of amplifiers depending on the first direction (col.5 ln.7-13); applying the first set of amplifiers to the first audio signal to produce first encoded signals (fig.3 #41-44); delaying the first audio signal to produce a first delayed audio signal (fig.3 #31 , col.4 ln.57-65); and applying the second set of amplifiers to the first delayed audio signal to produce second encoded signals (fig.3 "not labeled"), providing a third set of amplifiers and a fourth set of amplifiers, the gains of the amplifiers being functions of the scaling factors (fig.2 #11a, fig.3 #41-44, col.5 ln.7-13); receiving a second of the plurality of audio signals (fig.2 #9a); providing a second direction representing the direction of the source of the second audio signal (fig.2 #11a, col.4 ln.40-50); adjusting the gains of the third and the fourth set of amplifiers depending on the second direction (col.5 ln.7-13); applying the third set of amplifiers to the second audio signal to produce third encoded signals (fig.3 #41-44); delaying the second audio signal to produce a second delayed audio signal (fig.3 #31, col.4 ln.57-65); applying the fourth set of amplifiers to the second delayed audio signal to produce fourth encoded signals (fig.3 "not labeled"); mixing the first and the third encoded signals, or the first and the fourth encoded signals (fig.2 #12) to provide a left channel audio output; mixing the second and the fourth encoded signals, or the second and the third encoded signals (fig.2 #12) to provide a right channel audio output (col.7

ln.24-27), decoding the encoded signals using filters that are defined based on the spatial functions (fig.4 #70, col.7 ln.28-58).

McGrath does not disclose expressly wherein mixing the respective first through fourth encoded signals to provide left and right-channel audio outputs entails excluding the second encoded signal from the left-channel audio output and first encoded signal from the right-channel audio output.

Chen discloses a method of encoding left and right channel signals separately from one another (col.11 ln.30-61). Specifically in embodiment 4A, Chen discloses encoding the channels with filter weights (fig.4A #48), which in turn produces encoded signals (fig.4A #50). These encoded signals are mixed (fig.4A #54) to provide right and left-channel audio signals (fig.4A #56). In the method of Chen it is not required to mix each encoded signal to achieve the desired right and left-channel audio signals.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the separate channel encoding methods of Chen in the invention of McGrath.

The motivation for using the method of Chen in the invention of McGrath would have been to give the system a way to individually adjust the spatial characteristics of a channel without affecting the characteristics of the other channel. This could help compensate for users with hearing disabilities or could be used to compensate for a speaker arrangement where a listener is not equidistant from the speakers of the respective right and left-channels.

With respect to claim 2, McGrath discloses the method of claim 1 wherein the spatial functions are spherical harmonic functions (col.4 ln.7-26).

With respect to claim 3, McGrath discloses the method of claim 2 wherein the spherical harmonic functions include at least the first order harmonics (col.4 ln.7-12).

With respect to claim 5, McGrath discloses the method of claim 1 wherein for each of the first and second sets of amplifiers, the gain of each amplifier is based on a B-format encoding scheme (col.5 ln.7-13).

With respect to claim 7, McGrath discloses the method of claim 1 wherein the second signal is a synthesized audio signal. It is inherent that the encoding of the second signal (fig.2 #9a) in the B-Format Determination means (fig.2 #11a) would produce a synthesized signal.

With respect to claim 20, McGrath discloses a method of producing an audio signal from directionally encoded multi-channel audio signals, the method including: selecting set of spatial functions; generating a set of spectral functions based on the spatial functions; receiving a first set of directionally encoded audio signals (fig.4 "X", "W", "Y", "Z") encoded according to the set of spatial functions; receiving a second set of directionally encoded audio signals (fig.4 "X", "W", "Y", "Z") encoded according to the set of spatial functions; providing a first set of decoding filters defined by the set of spectral functions (fig.4 #70); providing a second set of decoding filters defined by the set of spectral functions (fig.4 #76)(col.7 ln.1-16); applying the first set of decoding filters to the encoded audio signals to produce a first set of filtered signals; and applying the second set of decoding filters to the encoded audio signals to produce a second set of

filtered signals (fig.5 #8); and providing the first set of filtered signals to a left-channel audio signal and providing the second set of filtered signals to a right-channel audio signal (col.7 ln.24-27).

McGrath does not disclose expressly wherein the first set of directionally encoded signals provides an encoded left-channel input that excludes the second set of encoded signals and wherein the second set of directionally encoded signals provides an encoded right-channel input that excludes the first set of encoded signals. The examiner would like to note that McGrath does disclose wherein the encoded signals provide left and right channels (fig.4 #82,83), however does not disclose the exclusion one set of encoded signals from the opposite channel.

Chen discloses a method of encoding left and right channel signals separately from one another (col.11 ln.30-61). Specifically in embodiment 4A, Chen discloses encoding the channels with filter weights (fig.4A #48), which in turn produces encoded signals (fig.4A #50). These encoded signals are mixed (fig.4A #54) to provide right and left-channel audio signals (fig.4A #56). In the method of Chen it is not required to mix each encoded signal to achieve the desired right and left-channel audio signals.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the separate channel encoding methods of Chen in the invention of McGrath to provide right and left channels that do not contain the same encoded signals.

The motivation for using the method of Chen in the invention of McGrath would have been to give the system a way to individually adjust the spatial characteristics of a

channel without affecting the characteristics of the other channel. This could help compensate for users with hearing disabilities or could be used to compensate for a speaker arrangement where a listener is not equidistant from the speakers of the respective right and left-channels.

With respect to claim 21, McGrath discloses the method of claim 20 wherein the set of spatial functions is defined by {gi(θ, φ), i = 0,1,...N-1} and generating the spectral functions includes providing Li(f) and Ri(f) such that Σ gi(θ, φ)Li(f) approximates L(θ, φ, f) (McGrath $hj,_{R(t)}$) and Σ gi(θ, φ)Ri(f) approximates R(θ, φ, f) (McGrath $hj,_{L(t)}$) where L(θ, φ, f) is a set of left ear HRTFs and R(θ, φ, f) is a set of right ear HRTFs, where {(θp, φp), p = 1,2, ... P} is a set of directions and f is frequency (col.8 ln.3-20).

With respect to claim 22, McGrath discloses the method of claim 21 wherein L(θ, φ, f) and R(θ, φ, f) are delay-free HRTFs (fig.5 #6). The use of the mixer in the McGrath reference supplies a delay free HRTF to the system before the signal is delayed in the FIR filters (fig.5 #8).

With respect to claim 23, McGrath discloses the method of claim 21 wherein providing Li(f) includes solving, at each frequency f, the vector equation L ≅ GL (col.6 ln.41-45),, where: the set of left ear HRTFs L(θ, φ, f) define a Px1 vector L, G is a PxN matrix whose columns are Px1 vectors Gi, i = 0,1, ...N-1 each of the N spatial functions g(θp, φp) defines the vector Gi, and the set of Li(f) defines the Nx1 vector L (col.6 ln.12-25).

With respect to claim 24, McGrath discloses the method of claim 23 wherein providing Li(f) is obtained by pseudo-inversion of the matrix G, resulting in L = (GTG)^-1GTL (col.6 ln.50-55).

With respect to claim 25, McGrath discloses the method of claim 24 wherein providing Li(f) includes projecting a Px1 vector L formed by the set of left ear HRTFs L(θ, φ, f) over each of the Px1 vectors Gi formed by the spatial functions g(θp, φp) to compute the scalar product Li (col.6 ln.40-55).

With respect to claim 26, McGrath discloses the method of claim 25 wherein an Nx1 vector L formed by the scalar products Li is multiplied by the inverse of the Gram matrix GTG (col.6 ln.50-55).

With respect to claim 27, McGrath discloses the method of claim 23 wherein providing Li(f) is obtained by L = (GTΔG)^-1GTL where Δ is a diagonal PxP matrix where the P diagonal elements are weights applied to the individual directions (θp, φp), p = 1,2,...P (col.6 ln.46 –62).

With respect to claim 28, McGrath discloses the method of claim 27 where each weight (col.6 ln.56-62) is proportional to a solid angle associated with the corresponding direction (col.5 ln.58-64, col.6 ln.12-25).

With respect to claim 29, McGrath discloses the method of claim 20 wherein the spatial functions are spherical harmonic functions (col.4 ln.7-26).

With respect to claim 30, McGrath discloses the method of claim 29 wherein the spherical harmonic functions include at least zero- and first- order harmonics (col.4 ln.7-12).

With respect to claim 31, McGrath discloses the method of claim 30 wherein the spectral functions define filters Lw(f), Lx(f), Ly(f), and Lz(f) (fig.4 #70), effective for decoding binaural B-format encoded signals WL, XL, YL, ZL, WR, XR, YR, and ZR, wherein the left channel audio signal is defined by WLLW(f) + XLLx(f) + YLLy(f) + ZLLz(f) (fig.4 #73) and the right channel audio signal is defined by WRLw(f) +XRLx(f) – YRLy(f) + ZRLz(f) (fig.4 #74, col.10 ln.27-33); whereby the left and right channel audio signals are suitable for playback with headphones (col.8 ln.27-38).

Claims 4 and 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath (US 6,259,795 B1) in view of Chen (US 6,990,205 B1) and in further view of McGrath et al (US 6,628,787 B1). For convenience the examiner will refer to McGrath (US 6,259,795 B1) as McGrath-A and McGrath et al (US 6,628,787 B1) as McGrath-B.

With respect to claim 4 McGrath-A discloses the method of claim 1, however does not disclose expressly wherein the spatial functions are discrete panning functions.

McGrath-B discloses the use of a panning function in a B-format, 3-D audio reproduction system (col.2 ln.4-25).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the panning system of McGrath-B in the B-format processing of McGrath-A.

The motivation for doing so would have been to pan for a first portion of the spatial sound field to a corresponding set of first speaker feeds as determined by the spatial direction as taught by McGrath-B (col.1 ln.42-45).

With respect to claim 34 McGrath-A discloses the method of claim 20, however does not disclose expressly wherein the spatial functions are discrete panning functions.

McGrath-B discloses the use of panning functions in an audio reproduction system wherein the panning functions have a direction, called a principal direction, where the spatial function is maximum and wherein all other spatial functions are zero (col.3 ln.13-36).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the panning system of McGrath-B in the B-format processing of McGrath-A.

The motivation for doing so would have been to pan for a first portion of the spatial sound field to a corresponding set of first speaker feeds as determined by the spatial direction as taught by McGrath-B (col.1 ln.42-45).

With respect to claim 35 McGrath-A discloses the method of claim 34 in view of McGrath-B, wherein the spectral function associated with each spatial function is the delay-free HRTF for the corresponding principal direction (McGrath-A fig.5 #6). The use of the mixer in the McGrath reference supplies a delay free HRTF to the system before the signal is delayed in the FIR filters (McGrath-A fig.5 #8).

With respect to claim 36 McGrath-A discloses the method of claim 34 in view of McGrath-B, however does not disclose wherein the spatial function has a principal direction.

McGrath-B discloses an audio reproduction system wherein one or more of the spatial functions have their principal direction corresponding to a direction of one of the loudspeakers (col.2 ln.21-25).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to have the principal direction of the panning function of McGrath-B in the direction of the sound source of McGrath-A.

The motivation for doing so would have been to provide an accurate direction of the sound source where the primary direction of the panning function would be concentrated on the source of the desired sound.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath (US 6,259,795 B1) in view of Chen (US 6,990,205) in view of Gerzon (US 4,086,433).

With respect to claim 32, McGrath discloses the method of claim 30 wherein the spectral functions define filters Lw(f), Lx(f), Ly(f), and Lz(f) (fig.4 #70,76,) effective for decoding binaural B-format encoded signals WL, XL, YL, ZL, WR, XR, YR, and ZR (fig.4 #71,72).

McGrath does not disclose expressly wherein the left audio signal comprises two signals and wherein the right audio signal comprises two signals.

The Gerzon reference discloses sound reproduction system wherein the left audio signal comprises two signals, a first signal Lb = 0.5(Wd – Xd + Yd) and a second signal Lf = 0.5(Wd + Xd + Yd) and the right audio signal comprises two signals, a first signal Rf = 0.5(Wd +Xd – Yd) and a second signal Rb = 0.5(Wd – Xd – Yd) (col.5 ln.12-19); whereby the left and right channel audio signals are suitable for playback over a pair of front speakers and a pair of rear speakers (fig.1).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to split the amplitude of the left and right audio signals of the McGrath reference in order to feed front and back speakers as in the Gerzon reference.

The motivation for doing so would have been to create a three-dimensional sound for multiple listeners without the use of headphones.

Claims 33 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath (US 6,259,795 B1) in view of Chen (US 6,990,205), in view of Gerzon (US 4,086,433) as applied to claim 32 above, and further in view of Clemow (US 6,577,736 B1).

With respect to claim 33, McGrath in view of Gerzon discloses the method of claim 32, however does not disclose expressly wherein cross-talk cancellation is performed on the front and rear speakers.

Clemow discloses performing a first cross-talk cancellation on the LF and RF signals to feed the front speakers; and performing a second cross-talk cancellation on

the LB and RB signals to feed the rear speakers (fig.8 "TCC - Transaural Crosstalk Cancellation", col.1 ln.39-57).

At the time of the invention it would have obvious to a person of ordinary skill in the art to have performed Clemow's cross-talk cancellation on the audio signals of Gerzon.

The motivation for doing so would have been to eliminate cross-talk between the signals of the front and rear speakers.

With respect to claim 37, McGrath discloses the method of claim 33 in view of Gerzon and Clemow, however does not disclose expressly wherein cross-talk cancellation is performed on the left and right audio signals.

Clemow discloses an audio reproduction system including performing crosstalk cancellation of the left and right audio signals before feeding the loudspeakers (fig.5)

At the time of the invention it would have obvious to a person of ordinary skill in the art to have performed Clemow's cross-talk cancellation on the audio signals of Gerzon.

The motivation for doing so would have been to eliminate cross-talk between the left and right audio signals.

Claims 38, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath (US 6,259,795 B1) in view of McGrath et al (US 6,628,787 B1) and in view of Chen (US 6,990,205), as applied to claim 34 above, and further in view of Clemow (US 6,577,736 B1).

With respect to claim 38, McGrath-B discloses the method of claim 34, however does not disclose expressly wherein the method includes producing front and back audio signals.

Clemow discloses an audio reproduction system that produces left-front and left back signals based on the left channel audio signal (col.5 ln.58-67, col.6 ln.1-19); producing right-front and right-back signals based on the right-channel audio signal; and combining the left-front, left-back, right-front, and right-back signals to produce outputs suitable for playback with a pair of front speakers (fig.5 #22a,22b) and a pair of rear speakers (fig.5 #22c,22d).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to split the left and right audio signals of McGrath-B to produce front and back signal as in the system of Clemow.

The motivation for doing so would have been to create a three-dimensional sound for multiple listeners without the use of headphones.

With respect to claim 39, McGrath-A discloses the method of claim 38 in view of Clemow and McGrath-B, however does not disclose expressly the use of cross-talk cancellation on the front and back speakers.

Clemow discloses performing a first cross-talk cancellation on the LF and RF signals to feed the front speakers; and performing a second cross-talk cancellation on the LB and RB signals to feed the rear speakers (fig.8 "TCC - Transaural Crosstalk Cancellation", col.1 ln.39-57).

At the time of the invention it would have obvious to a person of ordinary skill in the art to have performed Clemow's cross-talk cancellation on the audio signals of McGrath-A.

The motivation for doing so would have been to eliminate cross-talk between the signals of the front and rear speakers.

With respect to claim 40 McGrath-A discloses the method of claim 39 in view of Clemow, however does not disclose expressly wherein the spatial functions have a principal direction corresponding to the direction of the loudspeakers.

McGrath-B discloses the use of panning functions in an audio reproduction system wherein the panning functions have a principal direction corresponding to the direction of the loudspeakers (col.2 ln.21-25).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to have the principal direction of the panning function of McGrath-B in the direction of the sound source of McGrath-A.

The motivation for doing so would have been to provide an accurate direction of the sound source where the primary direction of the panning function would be concentrated on the source of the desired sound.

Response to Arguments

Applicant's arguments with respect to claims 1 and 20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason R. Kurr whose telephone number is (571) 272-0552. The examiner can normally be reached on M-F 10:00am to 6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571) 273-8300. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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